Attacking the “Science” of Field Sobriety Testing

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SFST 3 Test Battery

- Developed in late 70s
- Validated using data from <300 persons
- Only 18 over age 40
- Only 2 over age 60
- SFST Battery
  - Horizontal Gaze Nystagmus
  - Walk and Turn
  - One Leg Stand

Method Validation Terminology

- Accuracy: The degree of closeness of the measured experimental values to the true value
- Precision: The degree of variability among a series of measurements (degree of scatter) relative to the target
- Reproducibility: The precision and accuracy between measurements conducted intra- or inter-laboratory for an analyte using identical procedures, equipment, and methodologies
- Robustness: The precision and accuracy in measurement of an analyte under a variety of conditions
Precision and Accuracy

Short all over, poor precision and poor accuracy

All shots accurate and precise

All shots together, good precision but poor accuracy

Scientific Method

What are the most accurate and reliable SFSTs?

SCRI examined existing tests used
HGN, WAT & OLS accurate & reliable
SCRI conducted lab & field studies
HGN, WAT & OLS discriminated in field

SFSTs most reliable and accurate

NHTSA promulgates SFST curriculum

Original SCRI SFST Reliability

- HGN 77%
- WAT 68%
- OLS 65%
Ethanol

The SFSTs were validated to determine the probability a person with 4 or more clues had a BAC ≥ 0.10

Field Validation Studies

- Colorado (1995)
- Florida (1997)
- San Diego (1998)

Difference in Results

Conducted in the field with officers experienced in DWI detection and SFST
- Colorado - 86%
- Florida - 95% at 0.08% BAC
- San Diego - 91% at 0.08% BAC
  - HGN “Most Reliable” field sobriety test
Officers used were experienced with SFSTs. Proctored to insure the SFSTs were properly administered.

The 1990s field validation studies were primarily to determine what the probabilities for the SFSTs are at BAC ≥ 0.08.
Validity Requires Reproducibility

HGN Common Errors

- Fail to conduct mandatory equal tracking, equal pupil size checks
- Move stimulus too quickly when checking for lack of smooth pursuit
- Can miss clues, but
- Can induce catch-up saccades
- Only observe each eye fraction of time required
- Fail to hold for minimum 4 seconds at maximum deviation
- Can mistake for endpoint nystagmus
- Fail to move to maximum deviation
- Fail to correctly estimate 45 degree angle
- Fail to stop and make sure angle of onset is distinct and sustained
- Fail to conduct VGN test

WAT common errors

- Instruction and demonstration separately making suspect stand in instructional stance too long
- Failure to correctly demonstrate the test
- Failure to tell suspect to begin with their left foot as step # 1, inducing other clues
- Failure to tell the suspect to keep arms at sides throughout the test
- Failure to tell the suspect not to move until told to do so
- Suggesting non-validated clues instead of only: begins test before told to do so; losses balance during instructions; stops while walking; incorrect # steps; improper turn, steps off line, raises arms while walking, and misses heel to toe test; or
- Not using the NHTSA criteria for each of these
OLS common errors

- Failure to tell suspect not to raise arms from sides
- Failure to use clock to measure 30 seconds
- Suggesting that:
  - Failure to count out loud
  - Failure to hold foot exactly 6" off ground
  - Failure to look at foot
- ARE CLUES FOR STANDARDIZED TEST – ONLY SWAY, HOP, FOOT DOWN, AND RAISE ARMS ARE VALIDATED CLUES.

Robustness of HGN

- Study to demonstrate distance from face, height above eyes, and pace for lack of smooth pursuit didn’t alter reliability
- Researchers used experienced DRE/DRE instructors
- Test administrators still misclassified individuals with BAC < 0.08 with six HGN clues 14 times; with 4 HGN clues 16 times

Probabilities based on proper Administered – rarely exist in real life

- Inter-rater variability
- Intra-rater variability
- Due to:
  - Lack of experience
  - Bias
  - Poor instruction
  - Poor retention
  - Subject physiological variability
What About “Other” Drugs

- Literature search identified peer-reviewed research of SFSTs for ethanol or any other drug
- IACP/NHTSA peer-reviewed scientific research

Benzodiazepines

- Some tests that we expected to be related to blood benzodiazepine concentrations did not show such a relationship.
- This is for example, true for the horizontal gaze nystagmus.

Trazadone – CNS Depressant

- A one-time dose of trazadone 100 mg does not result in an increased SFST failure rate of 2 hours post dosing compared to acetaminophen 650 mg.
- There were subjects in both groups who failed tests at baseline (before receiving the drug or control).
- There were no statistical differences in failure rates for the HGN, WAT, and DLE between drug and control groups.
- The degree of decreased function is not as detrimental as reported for drivers with a BAC of 0.08% or greater.
- The effect of trazadone on SFSTs, Ip Eric J et al, Pharmacotherapy 2013
AMPHETAMINE

- “none of the three amphetamine doses impaired performance on the SFSTs”
- “were not found to impair performance on the HGN test”
- “did not impair performance on the WAT test, suggesting that this test may not be appropriate for identifying the presence of amphetamine. Improper turn (IT) occurred frequently across both the placebo and the amphetamine conditions.”
- “the three amphetamine doses administered did not impair performance on the OLS test. Although not significant, some improvements on the OLS test were observed in the amphetamine conditions.”


DEXTROMETHORPHAN

- A one time dose of 120 mg of dextromethorphan “did not demonstrate driving impairment on the driving simulator or increase SFST failures”
- “doses greater than the currently recommended maximum daily dose of 120 mg are necessary to perturb driving behavior”


OXICODONE

- “psychomotor and cognitive performance was not affected by any of the active drug conditions.”
- “10 mg of oral oxycodone combined with a low dose of ethanol”. These effects of oxycodone were not altered significantly by either dose of ethanol (no significant differences between oxycodone alone vs. in combination with ethanol).”

“On the five psychomotor/cognitive tests, there was no evidence of impairment in the active drug conditions compared to placebo.”

“there is a high correlation between degree of miosis and plasma oxycodone concentration. Miosis is considered to be a proxy for plasma oxycodone concentration.”

“It is important to note that three signs of the WAT test were unrelated to the level of THC at all administrations of the test: MHT (misses heel to toe), IT (improper turn), and INS (incorrect number of steps). These signs appeared almost as often in the placebo session as they did in the THC conditions and are therefore likely to be observed irrespective of drug consumption.”

An evaluation of the sensitivity of the SFSTs to detect impairment due to marijuana intoxication, Papafotious K, et al, Psychopharmacology, 2005

THC significantly increased the percentage of participants displaying impairments in the OLS compared to baseline performance from 21% to 50%.

WAT and the overall score on SFST did not discriminate between THC and baseline.

THC produced impairments on overall SFST performance in up to 50% of the participants (Papafotious 2005) but only 30% of the participants of the present study.


Only one sign from the WAT test – steps off line – was related to drug condition, for the remaining WAT signs, an equal number of participants displayed the errors across all drug conditions (including placebo).

This is important because these errors may be observed during the administration of the WAT test even when no drug has been consumed.

Detecting impairment associated with cannabis with and without alcohol on the SFST. Downey Luke et al, Psychopharmacology 2012
Conclusion

- Handout contains helpful quotes and references citations for DWI drug cases regarding cognitive and psychomotor coordination that didn't reference the SFSTs specifically.
- Questions?